REMARKS

Claims 1-18 are pending. Claims 10-14 are withdrawn from consideration and have been cancelled. Claims 1-9 and 15-18 are rejected. Claims 1 and 6 have been amended. The amendment to claim 1 positively sets for the constitution of "the ferromagnetic metal layer and the interface layer" which resulted from the language already included in claim 1, namely “the step of forming said ferromagnetic metal layer is a step of forming alternately a plurality of ferromagnetic films and one or more nonmagnetic metal spacer layer or layers in a multilayer.” Language changes in the second element of claim 1 and in claim 6 are related to the change in the first element of claim 1. The present claim amendments therefore do not substantially restrict the claims. Claims 15-18 are canceled. Claim 19 has been added. Claims 1-9 and 19 remain in the case.

The specification has been amended to correct a translation error on page 19, where recording medium 72 is incorrectly referred to as “perpendicular.” The relevant portion in the PCT Japanese specification that corresponds to the US application merely describes as "all the magnetic recording media 72" and does not include the word "perpendicular," and it has been found that "perpendicular" was added to the English specification by mistranslation. There is no description “perpendicular magnetic recording medium" in any other portions that relate to the magnetic recording media in the specification. Thus, the description describes “72 is a magnetic recording medium,” (paragraph 0121), “the discoidal magnetic recording medium 72” (paragraph 0122), “a plurality of magnetic recording media 72” (paragraph 0122), “each magnetic recording medium 72” (twice in paragraph 0123), “a magnetic recording medium 72 by rotating the magnetic recording medium 72” (paragraph 0125), “the magnetic recording medium 72” (3 times in paragraph 0123, 3 times in paragraph 0124, 4 times in paragraph 0115, 3 times in paragraph 0126), of the online published specification. Moreover, a person skilled in the art when reading the present specification in its entirety would understand that the magnetic recording medium of the present invention is a longitudinal magnetic recording medium. Correction of the specification is believed to be appropriate for consistency.

Claims 1-3, 6, 8, 9 and 15-18 are rejected under Section 103(a) based on Gill *et al.* ‘121 and JP 2002-25032 in view of Abarra *et al.* Gill is cited as disclosing

> a method of producing an MR sensor comprising a step of forming successively a nonmagnetic substrate, a metal underlayer and a ferromagnetic metal layer in a multilayer wherein the step of forming said ferromagnetic metal layer is a step of forming alternately a plurality of ferromagnetic films and one or more nonmagnetic metal

> spacer layer or layers in a multilayer, and comprising a step of allowing at least the interface of said nonmagnetic metal spacer layer or layers to adsorb physically oxygen and/or nitrogen (see fig 12; abstract).

The examiner admits that Gill does not disclose allowing at least the interface of said nonmagnetic metal spacer layer or layers to adsorb physically oxygen and/or nitrogen, or a mixed gas, but cites JP '032 as disclosing "allowing layer or layers to adsorb physically oxygen and/or nitrogen, or a mixed gas, further wherein the gas is a mixed gas obtained by mixing oxygen or nitrogen with Ar or other rare gases (paragraph 0071)." He urges that it would have been obvious to one with ordinary skill in the art to utilize allowing at least the interface of said nonmagnetic metal spacer layer or layers to adsorb physically oxygen and/or nitrogen, or a mixed gas for the purpose of enhanced signal to noise ratio characteristics.

As described in the abstract and in column 4, line 65 to column 5, line 7, Gill '121 discloses "an example of using the oxide, *i.e.*, CoFeHfO as a ferromagnetic metal layer of the pinned layer." However, "the purpose of using the oxide such as CoFeHfO is to further improve the magnetic resistance in MR (magnetoresistive device) for generating mirror reflection of conduction electrons." In clear contrast, as described in paragraph [0013] of the published specification of the present application (US 2005-10214584), a main subject of the present invention is "to provide a method of producing a magnetic recording medium having a flat surface, a high exchange bias field, and an excellent thermal stability", and as described in paragraph [0088] and Fig. 4 "a magnetic recording medium capable of realizing a stronger exchange bias field and being excellent in thermal stability can be produced by allowing oxygen and/or nitrogen to be adsorbed physically to the interface of the nonmagnetic metal spacer layer." Thus, the present invention differs from Gill '121 both in the purpose of oxygen adsorption and in the constituent of the oxide.

The invention of JP 2002-25032 also is basically different from the present invention. JP2002025032 is a counterpart of Maesaka (US 2002/0015864), which was discussed in the Action dated April 7, 2008. The present invention relates to a method of producing a magnetic recording medium comprising a step of successively forming a nonmagnetic substrate, a metal underlayer and a ferromagnetic metal layer which is a multilayer that is a plurality of alternating ferromagnetic films and one or more nonmagnetic metal spacer layer(s), in which at least the interface of the nonmagnetic metal spacer layer(s) is allowed to physically absorb oxygen and/or nitrogen. The present invention produces a medium having a flat surface, a high exchange bias field and an

excellent stability, as described in paragraph [0013], and solves problems with prior art structures that are described in the specification.

In contrast, JP '032 describes "a magnetic recording medium which greatly decreases a transition noise in a layered magnetic recording layer, excels in an S/N ratio, and is suited for short wavelength recording, the magnetic recording medium includes a vertical magnetic recording film 5 comprising an artificial lattice film formed by alternately layering a Pt or Pd layer and a Co layer and containing B and O elements." The B and O elements are contained in both the Co and Pt layers which constitute the layered magnetic recording layer 5.

JP '032 discloses a perpendicular magnetic recording film that contains B and O, but it includes no teaching or suggestion of the present invention in which oxygen and/or nitrogen are physically absorbed at least at the interface between a nonmagnetic metal spacer layer or layers and ferromagnetic films. In this regard, it appears that the examiner may be misinterpreting the description related to underlayer 4 of JP '032 as being of a nonmagnetic metal spacer layer as presently claimed. This is erroneous, as previously explained in connection with the rejection in the Action dated April 7, 2008 based on Maesaka 864.

In fact, no oxygen would be absorbed by layer 4, since the reference discloses that:

> The base layer 4 comprises a material containing metal having a face-centered cubic structure. Specifically, such a material can be Pd, Pt, Au, Ag, Rh, and Ir. Since *these materials hardly subject to chemical changes such as oxidation, nitrization, and the like*, it is also possible to use these alloys.[1]

If, on the other hand, the examiner is asserting that the alternating layers of cobalt and Pt or Pd suggest a plurality of ferromagnetic films and a nonmagnetic metal spacer layer formed between said ferromagnetic films, this also is incorrect. This arrangement does not teach or suggest "to insert a nonmagnetic metal intermediate layer between ferromagnetic layers" as presently claimed. The Pt layer or the Pd layer in JP '032 is *inductively magnetized* by the Co layer and therefore is not a *nonmagnetic* metal intermediate layer between ferromagnetic layers as recited in the present claims. Further, the magnetization of the layer adjacent to the Co layer becomes parallel. This is also apparent from the fact that the invention of JP '032 is a medium comprising a perpendicular magnetic recording film. Accordingly, it would not have been obvious based on JP '032 to allow the

[1] This is from paragraph 0035 of counterpart Maesaka '864, which reads better than the machine translation of JP '032.

interface between a nonmagnetic metal spacer layer or layers and adjacent ferromagnetic films to adsorb physically oxygen and/or nitrogen, as presently claimed.

In summary, the Pt layer or Pd layer in JP '032 is inductively magnetized by the Co layer and therefore **is not a nonmagnetic metal spacer layer** as presently claimed. Moreover, the magnetization of the adjoining Co layer becomes parallel, which follows from the fact that JP '032 relates to a perpendicular magnetic recording film (see abstract).

The examiner does not describe the reason for rejection of the claims 8 and 9 in the current action. However, in the action dated April 7, 2008 which cited the counterpart of JP '032, the examiner urged that Maesaka '864 discloses claim 8 (the nonmagnetic metal spacer containing at least one element selected from the group consisting of Ru, Ir, Cu and Os) and claim 9 (the nonmagnetic metal spacer having a specified thickness) of this application". However, this also is not correct as stated by the applicant in the response to the second office action. The only of the cited paragraphs in the JP '032 counterpart that were cited in the action dated April 7, 2008 which referred to an element selected from Ru, Ir, Cu and Os was paragraph 0052, which relates to underlayer 4. As described above, this layer is not a nonmagnetic metal spacer layer.

Abarra *et al.* is cited in the specification of the present application, and shows the state before the improvement of the present application. The difference of the present invention from Abarra *et al.* is that a magnetic recording medium capable of realizing a stronger exchange bias field and being excellent in thermal stability can be produced by allowing oxygen and/or nitrogen to be adsorbed physically to the interface of the non-magnetic metal spacer layer, as described above. No *prima facie* case of obviousness exists based on Gill in view of JP '032 and Abarra *et al.*, and reconsideration and withdrawal of this ground of rejection is respectfully requested.

Claims 4 and 5 are rejected under Section 103(a) based on Gill, JP '032 and Abarra in view of Schneemeyer *et al.* ('392).[2] The examiner urges that Schneemeyer *et al.* discloses partial pressure of oxygen for coating methods, citing column 6, lines 34-47. The cited portion discloses that "the above exemplary process is only one among many ways in which the materials may be formed. One skilled in the field would recognize that the deposition conditions may be optimized to achieve materials having desired dielectric properties, *e.g.*, the oxygen partial pressure…" In the first instance, it is noted that Schneemeyer *et al.* relates to deposition of dielectric films in silicon-chip integrated circuit devices, and thus can provide no guidance in selecting the partial pressure of

[2] It is noted that the reasons set forth in connection with this rejection refer to Tsuchiya *et al.* and fails to mention JP '032. This is believed to be in error.

oxygen to be used in the deposition of films in a magnetic recording medium as presently claimed. No prima facie case of obviousness exists based on Gill, JP '032 and Abarra in view of Schneemeyer *et al.*, and reconsideration and withdrawal of this ground of rejection is respectfully requested.

Claim 7 is rejected under Section 103(a) based on Gill, JP '032 and Abarra in view of Hartsough ('385).[3] Hartsough is cited as disclosing exposure to oxygen at 10 Langmuir or more. Hartsough relates to a process for applying aluminum oxide to thin film magnetic heads as a wear resistant coating by sputtering the dielectric onto the wafer. It therefore provides no guidance to the skilled artisan regarding the exposure of oxygen to be used in the deposition of films in a magnetic recording medium as presently claimed. No *prima facie* case of obviousness exists based on Gill, JP '032 and Abarra in view of Hartsough, and reconsideration and withdrawal of this ground of rejection is respectfully requested.

If there are any problems with this response, or if the examiner believes that a telephone interview would advance the prosecution of the present application, Applicant's attorney would appreciate a telephone call. In view of the foregoing, it is believed none of the references, taken singly or in combination, disclose the claimed invention. Accordingly, this application is believed to be in condition for allowance, the notice of which is respectfully requested.

Respectfully submitted,

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[3] It is noted that the reasons set forth in connection with this rejection refer to Tsuchiya *et al.* and fails to mention JP '032. This is believed to be in error.